# Evaluation of fatigue life of adhesively bonded aluminum single-lap joints using interfacial parameters

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## Abstract

This work experimentally studies the effect on adhesive dimensions on the fatigue strength of epoxy adhesively bonded aluminum single-lap joints. Various types of single-lap specimens with different overlap lengths and adhesive thicknesses were used in the experimental program to investigate the effect of bonding dimensions on fatigue strength. Experimental results indicate that under the fixed average shear stress condition, the larger adhesive thickness detrimentally affects fatigue strength. Similarly, the fatigue resistance decreases as the overlap increases except for the specimens with an adhesive thickness of 0.5 mm. The finite element method was adopted herein to obtain the local stress states at the interface between the adhesive and the adherend. Three selected parameters based on the simulated interfacial stresses were considered to correlate with the fatigue life data of all specimens with various adhesive dimensions. These parameters are maximum interfacial peeling stress, maximum interfacial shear stress and a linear combination of interfacial peeling stress and shear stress. These three interfacial parameters yield much better correlation results than the bulk average stress parameter. The evaluation results demonstrate that peeling stress and the linear combination of interfacial peeling stress and shear stress provide better correlation results than the interfacial shear parameters, revealing that the interfacial peeling stress is the main driving force of the fatigue failure of the single-lap joints.

Keyword：Fatigue; Finite element stress analysis; Joint design; Single-lap joint; Interface